

## WHAT IS CLAIMED IS:

1. A liquid crystal shutter comprising:

5 a liquid crystal device including a nematic liquid crystal sealed in between a first transparent substrate and a second transparent substrate on whose inner surfaces are formed respective transparent electrodes, said liquid crystal device having a twisted angle equal to or greater than  $180^\circ$ ; and

10 a pair of polarizing plates between which are sandwiched said first transparent substrate and said second transparent substrate, said polarizing plates having respective absorption axes which are substantially orthogonal to each other, said absorption axes of said polarizing plates being angled within a range of  $\pm 40^\circ$  to  $\pm 50^\circ$  relative to a direction in which intermediate liquid crystal molecules are orientated,  
15 said direction indicating a direction of orientation of said liquid crystal in an intermediate portion in a direction of thickness of said liquid crystal device.

2. A liquid crystal shutter comprising:

20 a liquid crystal device including a nematic liquid crystal sealed in between a first transparent substrate and a second transparent substrate on whose inner surfaces are formed respective transparent electrodes, said liquid crystal device having a twisted angle equal to or greater than  $180^\circ$ ; and

25 a pair of polarizing plates between which are sandwiched said

09887092-062501  
105290-26028860

first transparent substrate and said second transparent substrate, said polarizing plates having respective absorption axes which are substantially orthogonal to each other; wherein

5  $\Delta n d$  lies within a range of 600 to 900 nm, said  $\Delta n d$  being the product of a birefringence  $\Delta n$  of said nematic liquid crystal and a gap  $d$  between said first transparent substrate and said second transparent substrate.

10 3. A liquid crystal shutter according to claim 1, wherein  $\Delta n d$  lies within a range of 600 to 900 nm, said  $\Delta n d$  being the product of a birefringence  $\Delta n$  of said nematic liquid crystal and a gap  $d$  between said first transparent substrate and said second transparent substrate.

15 B' 4. A method of driving the liquid crystal shutter according to claim 1, wherein

a single drive term of said liquid crystal shutter is divided into a reset term during which all pixels of said liquid crystal shutter are rendered closed and a scan term during which all the pixels or

20 predetermined pixels are rendered opened or half-opened;

the duration of said scan term being made shorter than a holding time taken for a transmittance of said liquid crystal shutter to start to lower after it has reached its maximum with no driving voltage applied to

25 said liquid crystal shutter.

09887092.062501  
T05290.26078860

5. A liquid crystal shutter driving method according to claim 4,  
wherein

a positive or negative driving voltage is applied to said liquid  
5 crystal shutter during a partial period within said scan term, said driving  
voltage being set to 0V during a remaining period, said period during  
which said driving voltage is set to 0V being varied to perform a gradation  
display.

10 6. A liquid crystal shutter driving method according to claim 4,  
wherein

the voltage applied to said liquid crystal shutter in said scan  
term is varied from 0V to perform a gradation display.

15 7. A liquid crystal shutter driving method according to claim 4,  
wherein

a single driving term of said liquid crystal shutter is controlled,  
depending on an operating temperature, so as to be increased at a time of  
a low temperature but reduced at a time of a high temperature.

20

8. A method of driving a liquid crystal shutter according to claim 1,  
wherein

a single driving term of said liquid crystal shutter is assigned to  
a scan term during which all pixels or predetermined pixels of said liquid  
25 crystal shutter are rendered opened or half-opened, said scan term being

Cont  
B'

09887092.062501

controlled, depending on an operating temperature, so as to be lengthened at a time of a low temperature but shortened at a time of a high temperature.

5 9. A method of driving a liquid crystal shutter according to claim 2, wherein

a single drive term of said liquid crystal shutter is divided into a reset term during which all pixels of said liquid crystal shutter are rendered closed and a scan term during which all the pixels or  
10 predetermined pixels are rendered opened or half-opened;

the duration of said scan term being made shorter than a holding time taken for a transmittance of said liquid crystal shutter to start to lower after it has reached its maximum with no driving voltage applied to said liquid crystal shutter.

15 10. A liquid crystal shutter driving method according to claim 9, wherein

a positive or negative driving voltage is applied to said liquid crystal shutter during a partial period within said scan term, said driving  
20 voltage being set to 0V during a remaining period, said period during which said driving voltage is set to 0V being varied to perform a gradation display.

11. A liquid crystal shutter driving method according to claim 9,  
25 wherein

09887092, 062504  
T05290, 2604880

Concl  
B1

Cont  
B1

the voltage applied to said liquid crystal shutter in said scan term is varied from 0V to perform a gradation display.

12. A liquid crystal shutter driving method according to claim 9,  
5 wherein

a single driving term of said liquid crystal shutter is controlled, depending on an operating temperature, so as to be increased at a time of a low temperature but reduced at a time of a high temperature.

10 13. A method of driving a liquid crystal shutter according to claim 2, wherein

a single driving term of said liquid crystal shutter is assigned to a scan term during which all pixels or predetermined pixels of said liquid crystal shutter are rendered opened or half-opened, said scan term being  
15 controlled, depending on the operating temperature, so as to be lengthened at a time of a low temperature but shortened at a time of a high temperature.

14. A method of driving a liquid crystal shutter according to claim 3,  
20 wherein

a single drive term of said liquid crystal shutter is divided into a reset term during which all pixels of said liquid crystal shutter are rendered closed and a scan term during which all the pixels or predetermined pixels are rendered opened or half-opened;

25 the duration of said scan term being made shorter than a holding

09887692-062504

Cont  
B1  
time taken for a transmittance of said liquid crystal shutter to start to lower after it has reached its maximum with no driving voltage applied to said liquid crystal shutter.

5 15. A liquid crystal shutter driving method according to claim 14, wherein

10 a positive or negative driving voltage is applied to said liquid crystal shutter during a partial period within said scan term, said driving voltage being set to 0V during a remaining period, said period during which said driving voltage is set to 0V being varied to perform a gradation display.

16. A liquid crystal shutter driving method according to claim 14, wherein

15 the voltage applied to said liquid crystal shutter in said scan term is varied from 0V to perform a gradation display.

17. A liquid crystal shutter driving method according to claim 14, wherein

20 a single driving term of said liquid crystal shutter is controlled, depending on the operating temperature, so as to be increased at a time of a low temperature but reduced at a time of a high temperature.

18. A method of driving a liquid crystal shutter according to claim 3,  
25 wherein

09887092.052501

Comb  
B1

a single driving term of said liquid crystal shutter is assigned to  
a scan term during which all pixels or predetermined pixels of said liquid  
crystal shutter are rendered opened or half-opened, said scan term being  
controlled, depending on the operating temperature, so as to be  
5 lengthened at a time of a low temperature but shortened at a time of a  
high temperature.

ADD  
cl 7

09807092.062501